ToO update from MIRO

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Context and Model

Context

The first ToO:

- Is Located in the Imhotep region of the comet.

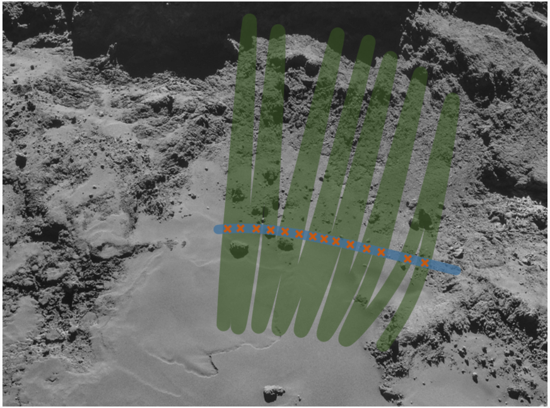

Figure 1: NAVCAM image of the Imhotep region with indicated the 2014 and 2016 swaths. Copyright: ESA/Rosetta/NAVCAM

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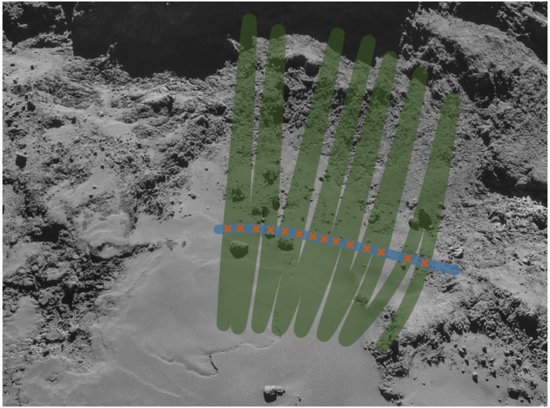
- Is Located in the Imhotep region of the comet.
- First observation: October 27th 2014 as a single swath.



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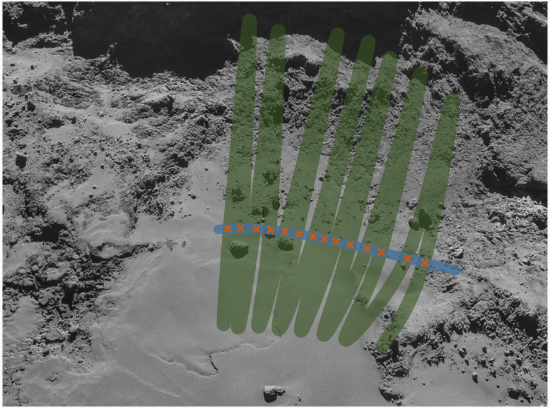
- Is Located in the Imhotep region of the comet.
- First observation: October 27th 2014 as a single swath.
- Second observation: July 9th 2016 as a raster scan.



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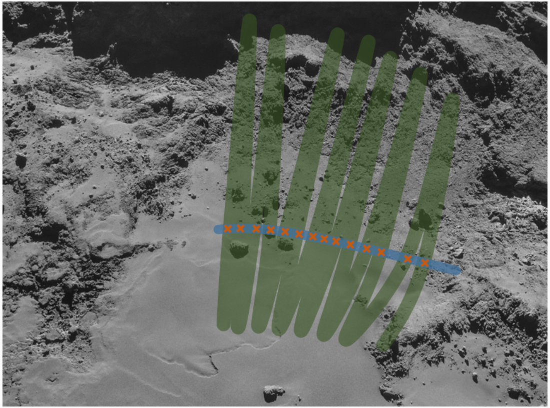
Context

The first ToO:

- Is Located in the Imhotep region of the comet.
- First observation: October 27th 2014 as a single swath.
- Second observation: July 9th 2016 as a raster scan.
- Objective: observe the same area twice with similar high spatial resolution.



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Measurements

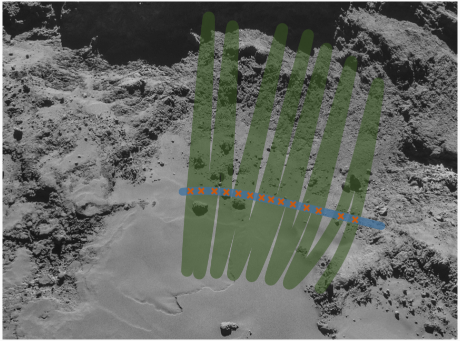


Figure 2: NAVCAM image of the Imhotep region with indicated the 2014 and 2016 swaths. Copyright: ESA/Rosetta/NAVCAM

Resolution	SMM	MM
October 2014	$\approx 20m$	$\approx 60m$
July 2016	$\approx 30m$	$\approx 90m$

The 2016 raster scan intersected the 2014 swath a total of 14 times.

Thermal and radiative model

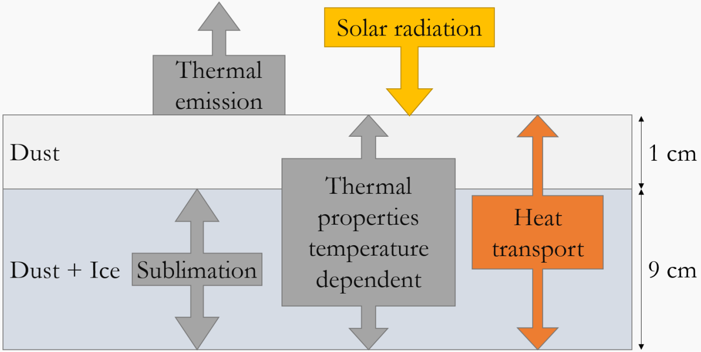


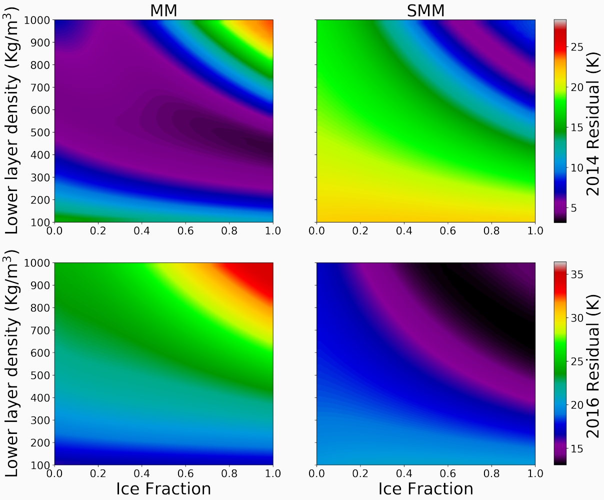
Figure 3: Simplified thermal model of the subsurface of 67P/C-G, indicating the processes at play

Thermal and radiative model

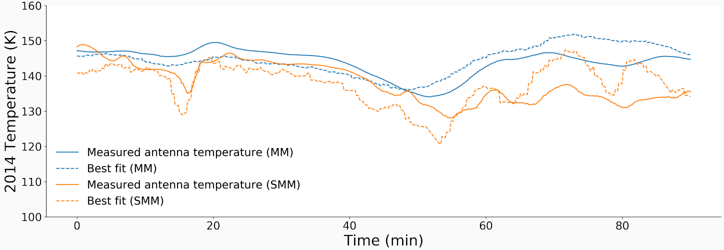
Parameters	MM	SMM
Pure dust density (Kg/m^3)	2500	
Pure ice density (Kg/m^3)	925	
Emissivity	0.9	
Albedo	0.04	
Penetration depth	$\approx 4cm$	$\approx 1cm$
Refraction index	$3.08 - j0.051$	$3.08 - j0.017$
Upper density	Variable	
Lower density		
Dust/ice ratio		

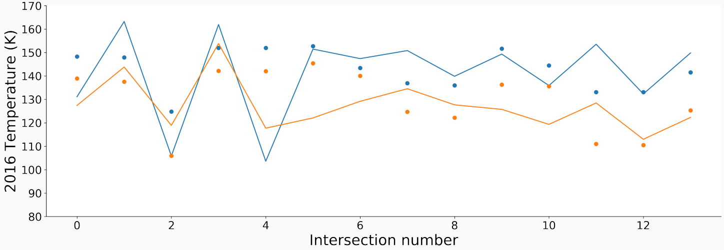
Results and Interpretations

Best fitting parameters in 2014 and 2016



Best fit for both times





Thermal inertia of the subsurface

Instrument	Region (date)	Thermal Inertia
MIRO[1]	All nucleus (2014)	10 – 50
MIRO[2]	Imhotep and Ash (September 2014)	10 – 30
MUPUS[3]	Abydos (November 2014)	50 – 120
MIRO[4]	Imhotep ToO (September 2014)	80 – 95

[1] Gulkis et al. (2015) [2] Schloerb et al. (2015) [3] Spohn et al. (2015) [4] This work

Porosity of the subsurface

Instrument	Depth sounded	Porosity
CONSERT[1]	Hundreds of meters	$75 - 85\%$
SESAME-PP[2]	First meter	$< 50\%$
MIRO[4]	10 cm	$50 - 60\%$
MUPUS[3]	Near surface	$30 - 65\%$

[1] Kofman et al. (2015) [2] Lethuillier et al. (2016) [3] Spohn et al. (2015) [4] This work

Conclusions and Perspectives

Conclusion and perspectives for the Imhotep ToO

- The model used in this work offers a powerful tool to investigate the subsurface of 67P/C-G using MIRO data and can help constrain the composition of the subsurface and its evolution through time.

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- The model used in this work offers a powerful tool to investigate the subsurface of 67P/C-G using MIRO data and can help constrain the composition of the subsurface and its evolution through time.
- More parameters need to be investigated in order to better fit the measurements of the Imhotep ToO.
- For this a MCMC algorithm will be used in future work.
- MIRO made observations of Imhotep at other times, and these will be included in future studies.